

PCT/TO-1390 (Modified)  
(Rev. 11-98)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

503235-25

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.5

09/701900

INTERNATIONAL APPLICATION NO.

PCT/NO99/00187

INTERNATIONAL FILING DATE

7 June 1999 (07.06.99)

PRIORITY DATE CLAIMED

8 June 1998 (08.06.98)

TITLE OF INVENTION

METHOD AND APPARATUS FOR DRYING A POROUS MATRIX

APPLICANT(S) FOR DO/EO/US

JONASSEN, Ola, STROMMEN, Ingvald, SCHIEFLO, Per Arne, ODILIO, Alves-Filho

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
  - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☒ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☐ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ Certificate of Mailing by Express Mail
20. ☐ Other items or information:

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PCT/NO99/00187

503235-25

04 DEC 2000

21. The following fees are submitted:

**BASIC NATIONAL FEE ( 37 CFR 1.492 (a) (1) - (5) ) :**

- ☒ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... \$1000
- ☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... \$840.00
- ☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$690.00
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... \$670.00
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) ..... \$96.00

**ENTER APPROPRIATE BASIC FEE AMOUNT =**

1000

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30

\$0.00

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	2 - 20 =	0	x \$18.00
Independent claims	- 3 =	0	x \$78.00

\$0.00

\$0.00

Multiple Dependent Claims (check if applicable). ☐

\$0.00

**TOTAL OF ABOVE CALCULATIONS =**

\$970.00

Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable). ☐

\$0.00

**SUBTOTAL =**

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30

\$0.00

**TOTAL NATIONAL FEE =**

\$970.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). ☐

\$0.00

**TOTAL FEES ENCLOSED =**

1000

Amount to be:  
refunded \$  
charged \$

- ☐ A check in the amount of \_\_\_\_\_ to cover the above fees is enclosed.
- ☒ Please charge my Deposit Account **5-1145** in the amount of **1000** to cover the above fees.  
A duplicate copy of this sheet is enclosed. (Order No. 503235.093800)
- ☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. \_\_\_\_\_ A duplicate copy of this sheet is enclosed.

**NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.**

SEND ALL CORRESPONDENCE TO:

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New York, New York 10017  
212-687-6000

*Joseph C. Sullivan*  
SIGNATURE

Joseph C. Sullivan  
NAME

18,720

REGISTRATION NUMBER

December 4, 2000

DATE

Method and apparatus for drying a porous matrix

The present invention is related to a method and an apparatus for producing a porous matrix from a solution, a paste, an extract, a granulated material or such, and the drying process.

Developments are continuously made to make processes and apparatus and connectors with freeze drying more economical, more accurate, to a higher degree capturing aromatic and nutritious ingredients during the freeze drying process.

With the method and the apparatus according to present invention, the dryer may operate at different temperature levels and inlet conditions below the freezing point of the material, enabling removal of substantial amount of moisture within a shorter residence time.

With the method according to the present invention is provided a flexibility on the operation since a solution, a suspension, a paste, juices, extract and even finely granulated sticky products can be mixed with an inert agent and expanded as to form a porous matrix. Said porous matrix is progressively dried as it is introduced into the drying chamber, said drying chamber thereby comprising means to adjust the inlet conditions as provided by the heat exchanger and the blower.

By closed loop circulation of the drying air or other media, processing contaminations are avoided and a maximum retention of the final product aroma or odorants as well as other heat sensitive organic components, which would have been lost in open processes.

Uncoupled heat exchangers provide conditioned drying media at appropriate and different levels as to attain minimum thermal inactivation while avoiding degradation of heat sensitive or delicate products. To avoid environmental and thermal pollutions, natural refrigerants are used in the uncoupled heat exchangers.

The above described advantages are achieved with the method and the apparatus according to the present invention as defined with the features stated in the claims.

The drawing discloses in Figure 1 schematically an apparatus according to the invention and Figure 2 discloses

enlarged a control valve used in the apparatus in Figure 1.

According to the invention, an inert agent is introduced into the structural raw material which may be a solution, a paste, an extract, a granulated material or such, whereafter the raw material is expanded to above or below the freezing point of the raw material and to a lower pressure, thereby producing a matrix mainly consisting of solids, pores and ice crystals. The resulting matrix may be frozen prior, or during the drying process or may be directly introduced into drying chamber.

The frozen matrix is placed into the drying chamber of the apparatus whereafter the dryer is activated. The moisture removed from the matrix is guided as an exhaust medium through a heat exchanger having cooled surface coils in which the water vapour condenses and thereafter is removed from the drying circuit.

In the next phase the drying medium is conditioned to the desired and preset inlet condition of the drying chamber by using the heated surface of the heat exchanger. This process is repeated continuously as the drying medium is reentered the drying chamber containing the matrix.

With the apparatus according to the present invention the inert agent is mixed with a matrix in a controlled mixing process. For this purpose the apparatus comprises several components also for conditioning the drying medium.

Reservoir 1 for the inert agent and reservoir 2 for the raw material are preferably made of stainless steel. The outlet of said reservoirs is accurately controlled for fine proposing of the mass fractions, by the use of flow meters and control valves. Pressure and temperature at the reservoir inlets and outlets are recognized by sensors and indicators arranged in the reservoir piping, fittings and connections.

The dryer as such consists of a closed loop in which the drying medium flows after being conditioned in the heat exchanger. The surfaces of the heat exchanger may be independently heated respectively cooled or may as such be connected with the appropriate refrigeration systems and heat pumps.

A blower, when activated, provides the flow of the

drying medium through drying chamber containing the fixed or fluidized bed of porous frozen matrix, whereafter the drying as such is accomplished by heat transfer and mass transport mechanisms. The heated and cooled surfaces of the heat exchanger promote dehumidification and conditioning of the drying medium and may be adjusted to provide desired specification and thermal sensitivity of the matrix by specific chamber designs and preset inlet conditions.

With the method and apparatus according to the present invention the dryer is able to operate at different temperature levels and the inlet conditions may be preset at or below the final freezing point of the raw material, such that nearly all of the moisture in the matrix is removed. In connection therewith, the circuit temperature of the heat exchanger may be changed in order to increase the temperature of the drying medium, controlling the relative humidity and consequently attaining a high degree of water removal and a short residence time of the matrix.

The design of the dryer as such enables use of only a fraction of the energy used in conventional processes. Furthermore the closed drying circuit avoids contamination as such, as frequently observed with commercial open systems.

Due to the higher operation temperature and higher operation pressure, the drying process according to the present invention is less expensive than commonly available drying systems having similar capacities. Furthermore the final product from the dryer provides higher and more uniform quality than conventional dryers and spray dryers operating at much higher temperature which furthermore is unsuitable for heat sensitive materials.

The only figure discloses schematically the apparatus arrangement with its vital components. A liquid inert agent is fed into a vessel 5 at controlled pressure and amount through a valve 7. The valve 7 also permits dosing the amount of inert agent inside vessel 5, as inspected through glass level indicator 8.

From the vessel 5 the pressurized liquid inert agent is transferred to the mixing vessel 4 which also receives the solution (paste, extract or granulated material) through an inlet

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valve 10. The pressure and temperature inside the mixing vessel 4 is adjusted through the release valve 6. A multi-propeller agitator 9 rotates accordingly to provide a complete mixing of the inert agent with the solution.

5           From the mixing vessel 4, the solution is expanded into a porous matrix and is injected into drying circuit through the drying chamber 3. The matrix is kept suspended in the drying chamber by the flowing drying medium, which is supplied by the blower 2.

10           Besides keeping the porous matrix suspended during the process, the medium re-circulates the drying circuit in a closed loop. After removing the matrix moisture the exhaust medium is moved through a heat exchanger coil comprising a first heat exchanger 11 where the water vapour is condensed and removed from  
15 the circuit. Thereafter the drying medium is adjusted to the desired inlet condition in the heat exchanger 1. Finally the drying medium flows through the matrix and the process is repeated.

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P a t e n t   C l a i m s

5           1. Method of drying a medium for producing a porous matrix from a solution, a paste, an extract, a granulated material or such, **CHARACTERIZED IN** feeding a liquid inert agent into a vessel (5) at controlled pressure and amount through a valve (7), transferring the pressurized liquid inert agent to a  
10 mixing vessel (4), said mixing vessel (4) also receiving the solution, such as paste, extract or granulated material, through an inlet valve (10), adjusting the pressure and temperature inside the mixing vessel (4) to desired levels by a release valve (6), upon complete mixing of the inert agent with the solution,  
15 the mixture is expanded into a porous matrix and injected into a drying circuit through a drying chamber (3), the matrix thereby being kept suspended in the drying chamber by the flowing drying medium, supplied by the blower 2, the matrix moisture being removed from the mixture through a heat exchanger coil comprising  
20 a first heat exchanger (11) where the water vapour is condensed and removed from the circuit and finally the drying medium is adjusted to the desired inlet condition in a heat exchanger (1) before the drying medium flows through the matrix and the process is repeated.

25           2. Apparatus adapted for drying a medium for producing a porous matrix from a solution, a paste, an extract, a granulated material or such, **CHARACTERIZED IN** the apparatus comprising a valve (7) being connected with a vessel (5) for feeding a liquified inert agent into the vessel (5) at controlled  
30 pressure and rate, the valve (7) thereby allowing dosing of the agent, a mixing vessel (4) being connected with the vessel (5) adapted to receive pressurized liquid inert agent as well as a solution such as a paste, an extract or a granulated material, through an inlet valve (10), a release valve (6) thereby  
35 controlling the pressure and the temperature inside the mixing vessel (4), an agitator (9) inside the mixing vessel (4) thereby ensuring complete mixing of the agent with the solution, a drying chamber (3) being connected with the mixing vessel (4) to receive the mixture as a porous matrix which thereby is injected into a

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drying circuit through the drying chamber (3), and a first heat exchanger (10) being connected with the circuit for condensing and removing the water vapour from the circuit, the drying medium thereafter being adjusted to the inlet condition of the drying chamber (3) by a second heat exchanger (1).

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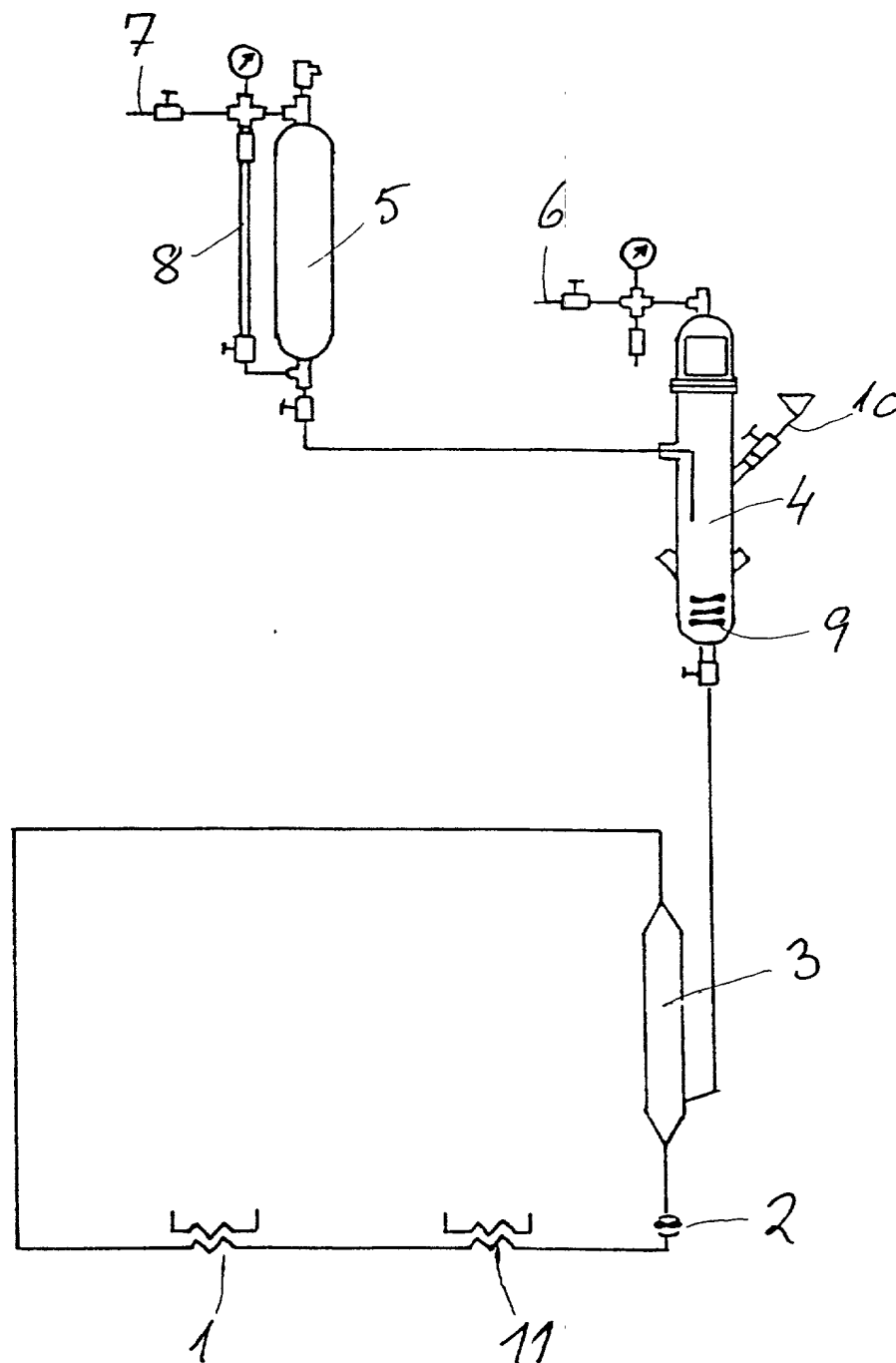
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PTO/USPT (7-97)

78700-55

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<b>DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION</b> (37 CFR 1.63)	<b>Attorney Docket Number</b> 503235-25
	<b>First Named Inventor</b> JONASSEN, Ola
	<b>COMPLETE IF KNOWN</b>
	<b>Application Number</b> /
	<b>Filing Date</b>
<input type="checkbox"/> Declaration Submitted with Initial Filing	<input type="checkbox"/> Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)
<b>Group Art Unit</b>	
<b>Examiner Name</b>	

As a inventor named inventor, I hereby declare that:

my residence, past office address, and citizenship are as stated below next to my name.

I declare I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought as the invention relating:

**METHOD AND APPARATUS FOR DRYING A POROUS MATRIX**

The specification of which (Title of the Invention)

☐ is attached hereto

OR

☒ was filed on (MM/DD/YYYY) June 7, 1999 as United States Application Number or PCT International

Application Number E-74099/00167 and was awarded on (MM/DD/YYYY) (if applicable).

I hereby state that I have reviewed and understood the contents of the above identified specification, including the claims, as amended by any amendments specifically referred to above.

I understand the duty to disclose information which is material to patentability as defined in 37 CFR 1.60.

I hereby claim priority hereto under 35 U.S.C. 119(a)-(d) or 3602) of any foreign application(s) for patent or inventor's certificate, or 3602(a) of any PCT International application which designated at least one country other than the United States of America, filed before and have also identified herein, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
19982626	Norway	06.06 1998	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/USPT attached hereto.

I hereby state the basis under 35 U.S.C. 119(a)-(d) or 3602(a) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)	<input type="checkbox"/> Additional provisional application numbers are listed on a supplemental priority data sheet PTO/USPT attached hereto.

[Page 1 of 3]

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Approved for Release 2001/08/02 : CIA-RDP80-01062A000100010001-5

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### DECLARATION — Utility or Design Patent Application

I hereby claim the benefit under 35 U.S.C. 112 of any United States application(s), or 35(1b) of any PCT international application designating the United States of America, filed before and prior to the filing date of any of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of 35 U.S.C. 112. I acknowledge the duty to disclose information which is material to substantially as defined in 37 CFR 1.101 which becomes available between the filing date of the prior application and the filing of PCT international filing date of this application.

U.S. Parent Application or PCT Parent Number *	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)
PCT/JP99/00187	06.07.1999	

☐ Additional U.S. or PCT international application numbers are listed on a supplementary priority basis under PTC63/635 (wherever needed)

As a named owner, I hereby accept the following registered trademark(s) in connection with the operation and to support of business of the Primary and Trademark Office connected thereto:

**Cluster Number**

**Figure 2**

Category	Sub-category	Value
Total	1990-1991	100.00
	1992-1993	100.00

**PLATE COMPANY  
MUNICH, GERMANY**

**Notes**

Name	Registration Number	Name	Registration Number
Joseph C. Sullivan	18,720	John F. Gubbia	33,140
Gerald Levy	28,419	Matthew W. Siegal	32,941
Ronald E. Santucci	28,888	Peter W. Latimer	46,858
Ronald E. Strain	32,200		

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24 ☒ Correspondence address below

Name	Joseph C. Sullivan				
Address	Pitney, Hardin, Ripp & Seach LLP				
Address	711 Third Avenue, 20th Floor				
City	New York	State	NY	Zip	10017
Country	U.S.A.	Telephone	212-687-6000	Fax	212-682-3485

I hereby declare that all statements made herein are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that said statements and the fact as stated are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such will make statements may jeopardize the validity of the admission of any other person to the United States.

**Name of Sale or First Inventor:**

☐ A patient has been filed for this assigned treatment

**Given Name (Last and middle if any)**

Family Name or Surname

010

**JONASSEN**

Inventor's Signature	<i>Ola J. Jansen</i>				Date	27/4-20
Residence: City		State		Country		Patent No.
Post Office Address	NOX					
Post Office Address	Flesbakk, N-2064 Bratsberg, Norway					
City		State		Country		
<input type="checkbox"/> Additional Inventors are being named on the <u>Swedish</u> Additional Inventors) (initials) PTO/GB/2A attached hereto						

☐ Additional inventors are being named on this application. Additional inventor(s) listing PTO/SB32 attached hereto.

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# DECLARATION

ADDITIONAL INVENTOR(S)  
Supplemental Sheet  
Page 1 of 1

Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unsigned inventor	
Given Name (first and middle if any)		Family Name or Surname	
Ingvald		Strømgen	
Inventor's Signature	Date		02.04.01
Residence: City	State	Country	Zip
Post Office Address			
Post Office Address: Veierstien 74, N-7053 Rønneheim, Norway			
City	State	Country	Zip
Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unsigned inventor	
Given Name (first and middle if any)		Family Name or Surname	
Per Arne		Schieflo	
Inventor's Signature	Date		
Residence: City	State	Country	Zip
Post Office Address			
Post Office Address: Osløveien 6, N-7018 Trondheim, Norway			
City	State	Country	Zip
Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unsigned inventor	
Given Name (first and middle if any)		Family Name or Surname	
Othello		Alvåg-Fillip	
Inventor's Signature	Date		
Residence: City	State	Country	Zip
Post Office Address			
Post Office Address: Rindveien, 16B, N-7032 Katten, Norway			
City	State	Country	Zip

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(July 1999)

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<b>DECLARATION</b>	<b>ADDITIONAL INVENTOR(S)</b> Supplemental Sheet Page 1 of 1
--------------------	--

Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unassigned inventor	
Given Name (first and middle if any)		Family Name or Surname	
Invald		Schjorren	
Inventor's Signature	Date		5 July 9, 2001 *
Residence City	State	Country	Classification NO
Post Office Address			
Post Office Address: Torshovveien 74, N-7053 Ræheim, Norway			
City	State	Zip	Country
Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unassigned inventor	
Given Name (first and middle if any)		Family Name or Surname	
Per Arne		Schjorle	
Inventor's Signature	Date		July 16, 2001 *
Residence City	State	Country	Classification NO
Post Office Address			
Post Office Address: Osloveien 6, N-7018 Trondheim, Norway			
City	State	Zip	Country
Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unassigned inventor	
Given Name (first and middle if any)		Family Name or Surname	
Ole-Liv		Alves-Filho	
Inventor's Signature	Date		
Residence City	State	Country	Classification NO
Post Office Address			
Post Office Address: Roddevann. 16P, N-7002 Katten, Norway			
City	State	Zip	Country

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(July 1998)